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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,377	09/30/2003	Ulrich Neumann	06666/156001/USC-3345	3241

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EXAMINER	
AMINI, JAVID A	

ART UNIT	PAPER NUMBER
2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/676,377	NEUMANN ET AL.	
	Examiner	Art Unit	
	Javid A. Amini	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _12 April 2007_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _2-10,12,13,15-17,20-23,25,26,29-31,33,34,37-39 and 45-47_ is/are pending in the application.

4a) Of the above claim(s) _1, 11, 14, 24, 27, 28, 32, 35, 36, 40-44, and 48-49_ is/are withdrawn from consideration.

5)☐ Claim(s) _25,26,29-31,33,34 and 37-39_ is/are allowed.

6)☒ Claim(s) _2-10,12,13,15-17,20-23 and 45-47_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _4/12/2007_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/12/2007 has been entered.

Allowable Subject Matter

Claims 29, 25-26, 30-31, 33-34, and 37-39 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: The closest prior art, Benjamin, Tuceryan, and Rong show similar limitations but not in the same combination of <u>identifying a region in motion in real time further comprises estimating the background image by modeling the background image as **a temporal pixel average of five recent image frames in the real-time video imagery information.**</u>

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 4-5, 7-10, 12, 13, 15-17, and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benjamin Lok, the title is "Online model reconstruction for interactive virtual environments" March 2001, hereinafter Benjamin, and in view of Tuceryan et al. US 2002/0113756 A1, (hereinafter refers as Tuceryan).

Claim 12.

Benjamin in the abstract on page 69 teaches a method comprising: generating a three dimensional model of a three dimensional environment from range sensor information representing a height field (Benjamin on page 71 under section 3 right column at fourth paragraph teaches an elevation of an object above a table) for the environment; Benjamin on page 71 section 2.4 at second paragraph teaches keeping track of which source images contribute to a final pixel result, i.e. similar to claim limitation of " tracking orientation information of at least one image sensor in the environment with respect to the three dimensional model in real-time". Also Benjamin on page 69 under "related work" teaches in Virtual Environments required additional trackers to control the motion of a model. Benjamin on page 69 section 1 at first paragraph teaches an immersive virtual environments (IVE), see following claim limitation: projecting real-time video imagery information from the at least one image sensor onto the three dimensional model based on the tracked orientation information. Benjamin on page 70 left column at second paragraph teaches visualizing the three dimensional model with the projected real-time video imagery. Benjamin on page 73 in figures 4-5 explicitly illustrates projecting the real-time video imagery information comprises generating a depth map image from a video sensor viewpoint, and projective texture mapping the real-time video imagery information onto the three dimensional model conditioned upon visibility as determined from the generated depth map image. Examiner's note: in figs. 4-5 illustrates generating a depth map and projective texture mapping. Benjamin on page 69 right column at second paragraph teaches using a framebuffer to compute results in a massively parallel manner.

Benjamin does not disclose using a one-pass approach on graphics hardware that supports SGI OpenGL extensions, see following claim limitation: wherein generating the depth map image and projective texture mapping the real-time video imagery information are performed using a one-pass approach on graphics hardware that supports SGI OpenGL extensions. In the specification [0080] discloses that the approach in fig. 4 represents a two-pass process, and on page 32 [0080] discloses this approach <u>can be implemented as a one-pass approach</u>.

However, Tuceryan teaches camera calibration methods for augmented reality. Tuceryan in fig. 9 illustrates tracker camera 92 and scene camera 91 are connected to SGI that supports OpenGL, obviously performing using a one-pass approach on graphics hardware SGI540.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Tuceryan's SGI 540 into Benjamin's SGI Reality Monster system for an efficient and less computationally-intensive technique to recover mapping and projecting texture into 3-D model.

Claim 2.

Benjamin on page 73 illustrates 3D models; also on page 71 right column at forth paragraph teaches reconstruction from different viewpoints.

Claim 4.

Benjamin on page 72 left column at third paragraph teaches multiple camera inputs as an image sensor.

Claim 5.

Benjamin teaches the claim limitation, because on page 71 section 2.4 teaches for each mesh point each vertex gets its color, and at right column third paragraph teaches the vertices are

modulated with the applied texture. It means there is a regular grid at a user-defined to produce the height and depth field.

Claim 7.

Benjamin in the abstract teaches generating models with lighting in IVEs, and gives results using synthetic and real data. Benjamin uses a novel visual hull.

Claims 8-9.

Benjamin on page 70 left column first and second paragraphs teaches the claim limitations as the system enables users to see their arm and a real book in the VE, and naturally reach out and pick up the book. The system has two distinct goals, providing the user visual feedback of his body and nearby real objects, and generating real time models for rendering, simulations, and interactions with the virtual environment. The cameras can be situated remotely to have a global navigational satellite system receiver, as Benjamin on page 72 section 4 teaches the user is tracked with a scalable wide-area traker.

Claim 10.

Benjamin in fig. 2 illustrates multiple image sensors as multi cameras and projecting the real time imagery information onto 3D model.

Claim 13.

Benjamin does not teach using a stereo video-projector coupling to a user's head position.

However, Tuceryan in fig. 9 illustrates the claim limitations.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Tuceryan's SGI 540 into Benjamin's SGI Reality Monster system for an

efficient and less computationally-intensive technique to recover mapping and projecting texture into 3-D model.

Claim 22.

Benjamin in the abstract on page 69 teaches a system comprising: generating a three dimensional model of a three dimensional environment from range sensor information representing a height field (Benjamin on page 71 under section 3 right column at fourth paragraph teaches an elevation of an object above a table) for the environment; Benjamin on page 71 section 2.4 at second paragraph teaches keeping track of which source images contribute to a final pixel result, i.e. similar to claim limitation of " tracking orientation information of at least one image sensor in the environment with respect to the three dimensional model in real-time". Also Benjamin on page 69 under "related work" teaches in Virtual Environments required additional trackers to control the motion of a model. Benjamin on page 69 section 1 at first paragraph teaches an immersive virtual environments (IVE), see following claim limitation: projecting real-time video imagery information from the at least one image sensor onto the three dimensional model based on the tracked orientation information. Benjamin on page 70 left column at second paragraph teaches visualizing the three dimensional model with the projected real-time video imagery. Benjamin on page 73 in figures 4-5 explicitly illustrates projecting the real-time video imagery information comprises generating a depth map image from a video sensor viewpoint, and projective texture mapping the real-time video imagery information onto the three dimensional model conditioned upon visibility as determined from the generated depth map image. Examiner's note: in figs. 4-5 illustrates generating a depth map and projective

texture mapping. Benjamin on page 69 right column at second paragraph teaches using a framebuffer to compute results in a massively parallel manner.

Benjamin does not disclose using a one-pass approach on graphics hardware that supports SGI OpenGL extensions, see following claim limitation: wherein generating the depth map image and projective texture mapping the real-time video imagery information are performed using a one-pass approach on graphics hardware that supports SGI OpenGL extensions. In the specification [0080] discloses that the approach in fig. 4 represents a two-pass process, and on page 32 [0080] discloses this approach <u>can be implemented as a one-pass approach</u>.

However, Tuceryan teaches camera calibration methods for augmented reality. Tuceryan in fig. 9 illustrates tracker camera 92 and scene camera 91 are connected to SGI that supports OpenGL, obviously performing using a one-pass approach on graphics hardware SGI540. Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Tuceryan's SGI 540 into Benjamin's SGI Reality Monster system for an efficient and less computationally-intensive technique to recover mapping and projecting texture into 3-D model.

Claim 15.

Benjamin in fig. 2 illustrates multiple image sensors as multi cameras and projecting the real time imagery information onto 3D model.

Claim 16.

The claim limitation is obvious because Benjamin in the abstract teaches real objects in an immersive virtual environment for visualization and interaction. Also on page 71 section 4 at third paragraph teaches video and memory.

Claim 17.

The claim limitation is obvious because when generating a 3D image, the viewpoint of the video imagery projection should be separate from viewpoints from multiple image sensors (see, Benjamin's multi cameras in fig. 2).

Claim 20.

Benjamin in fig. 2 illustrates multiple image sensors as multi cameras and projecting the real time imagery information onto 3D model.

Claim 21.

Benjamin on page 70 left column first and second paragraphs teaches the claim limitations as the system enables users to see their arm and a real book in the VE, and naturally reach out and pick up the book. The system has two distinct goals, providing the user visual feedback of his body and nearby real objects, and generating real time models for rendering, simulations, and interactions with the virtual environment. The cameras can be situated remotely to have a global navigational satellite system receiver, as Benjamin on page 72 section 4 teaches the user is tracked with a scalable wide-area traker.

Claim 23.

Benjamin does not teach using a stereo video-projector coupling to a user's head position.

However, Tuceryan in fig. 9 illustrates the claim limitations.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Tuceryan's SGI 540 into Benjamin's SGI Reality Monster system for an efficient and less computationally-intensive technique to recover mapping and projecting texture into 3-D model.

Claim 3, 6, 18-19 and 45-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benjamin Lok, the title is "Online model reconstruction for interactive virtual environments" March 2001, and in view of Tuceryan et al. US 2002/0113756 A1, and further in view of Rong et al. US 6,879,946 B2, hereinafter Rong.

Claim 3.

Benjamin and Tuceryan do not teach selecting geometric primitives from a group including a sphere primitive and a cuboid primitive.

However, Rong at col. 2 lines 50-57 teaches the claim limitation. Rong at col. 3 line 6 teaches fitting complex 3D shapes.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Rong's AHR (Attributed hypergraph representations) into Tuceryan and Benjamin in order to improve modeling of a 3D scene and by applying a set of AH operators to its AHR. The AHR method forms a data compression system for efficient web streaming over the Internet.

Claim 6.

Benjamin and Tuceryan do not teach hole fitting and tessellation.

However, Rong at col. 13 lines 34-38 teaches hole filling (by evaluating the distance between pairs of neighboring points) and tessellation (see col. 3 line 50) to generate a polygon mesh.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Rong's AHR (Attributed hypergraph representations) into Tuceryan and Benjamin in order to improve modeling of a 3D scene and by applying a set of AH operators to

its AHR. The AHR method forms a data compression system for efficient web streaming over the Internet.

Claim 18.

Benjamin on page 73 illustrates 3D models; also on page 71 right column at forth paragraph teaches reconstruction from different viewpoints (i.e. similar to different sections of the structure, in the claim). Benjamin and Tuceryan do not teach selecting geometric primitives based at least in part on input from a person regarding different shapes.

However, Rong at col. 2 lines 50-57 teaches selecting geometric primitives based at least in part on input from a person regarding different shapes. Rong in the abstract teaches a range information is first computed then a model is constructed. Rong at col. 3 line 6 teaches fitting complex 3D shapes.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Rong's AHR (Attributed hypergraph representations) into Tuceryan and Benjamin in order to improve modeling of a 3D scene and by applying a set of AH operators to its AHR. The AHR method forms a data compression system for efficient web streaming over the Internet.

Claim 19.

Benjamin teaches the claim limitation, because on page 71 section 2.4 teaches for each mesh point each vertex gets its color, and at right column third paragraph teaches the vertices are modulated with the applied texture. It means there is a regular grid at a user-defined to produce the height and depth field.

Benjamin and Tuceryan do not teach hole fitting and tessellation.

However, Rong at col. 13 lines 34-38 teaches hole filling (by evaluating the distance between pairs of neighboring points) and tessellation (see col. 3 line 50) to generate a polygon mesh.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Rong's AHR (Attributed hypergraph representations) into Tuceryan and Benjamin in order to improve modeling of a 3D scene and by applying a set of AH operators to its AHR. The AHR method forms a data compression system for efficient web streaming over the Internet.

Claim 45.

Benjamin and Tuceryan do not teach selecting geometric primitives from a group including a sphere primitive and a cuboid primitive.

However, Rong at col. 2 lines 50-57 teaches the claim limitation. Rong at col. 3 line 6 teaches fitting complex 3D shapes. Rong at col. 2 lines 35-29 teaches that the geometrical modeling is the basic requirement for any vision or graphics system.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Rong's AHR (Attributed hypergraph representations) into Tuceryan and Benjamin in order to improve modeling of a 3D scene and by applying a set of AH operators to its AHR. The AHR method forms a data compression system for efficient web streaming over the Internet.

Claim 46.

Benjamin and Tuceryan do not teach selecting geometric primitives from a group including a sphere primitive and a cuboid primitive.

However, Rong at col. 2 lines 50-57 teaches the claim limitation. Rong at col. 3 line 6 teaches fitting complex 3D shapes. Rong at col. 2 lines 35-29 teaches that the geometrical modeling is the basic requirement for any vision or graphics system.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Rong's AHR (Attributed hypergraph representations) into Tuceryan and Benjamin in order to improve modeling of a 3D scene and by applying a set of AH operators to its AHR. The AHR method forms a data compression system for efficient web streaming over the Internet.

Claim 47.

Benjamin and Tuceryan do not teach selecting geometric primitives from a group including a sphere primitive and a cuboid primitive.

However, Rong at col. 2 lines 50-57 teaches the claim limitation. Rong at col. 3 line 6 teaches fitting complex 3D shapes. Rong at col. 2 lines 35-29 teaches that the geometrical modeling is the basic requirement for any vision or graphics system.

Thus, it would have been obvious to one ordinary skill in the art at the time the invention was made to combine Rong's AHR (Attributed hypergraph representations) into Tuceryan and Benjamin in order to improve modeling of a 3D scene and by applying a set of AH operators to its AHR. The AHR method forms a data compression system for efficient web streaming over the Internet.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Javid A. Amini whose telephone number is 571-272-7654. The examiner can normally be reached on 8-4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kee Tung can be reached on 571-272-7794. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Javid A Amini
Examiner
Art Unit 2628

J.A.